REMARKS

The present Response is submitted in response to the Official Action of June 20, 2007.

Accompanying this Response please find copies of the two missing foreign references, namely, DE 77 18 674U1 and DE 649 10 421 T2, which were cited in the previously filed Information Disclosure Statement. If a petition and/or an official fee is required in order for the Examiner to timely consider this previously cited art at this time, please consider this to be the necessary petition and charge any necessary official fee to the below listed deposit account so that this art may be timely considered at this time.

The Examiner objects to the drawings, under 37 CFR 1.83(a), as not showing the torque measurement device fitted directly on or in the turbine rotor as recited, for example, in claims 15 and 20. In a related claim rejection, claims 15 and 20 are rejected, under 35 U.S.C. § 112, first paragraph, as reciting subject matter not disclosed in the specification, again referring to the torque measurement device fitted directly on or in the turbine rotor.

Before addressing these rejections, however, the Applicant also wishes to point out that in the present Official Action the Examiner cites Niikura et al. `737, under 35 U.S.C. § 102, as showing and describing a magnetic transducer of the type described in the present invention and recited in the presently pending claims of this Application. It is the Applicant's position that the Examiner is thereby explicitly stated that a magnetic transducer of the type recited in the presently pending claims is known to those of ordinary skill in the arts as a result of being taught by Niikura et al. `737. The rejections of the claims, under 35 U.S.C. § 112, on the grounds that the transducer is not adequately taught in the present Application, and is not otherwise known to those of ordinary skill in the arts, is thereby in direct contradiction to the Examiner's rejection of the claims, under 35 U.S.C. § 102, on the grounds that the transducer is shown and taught in Niikura et al. `737.

The Applicant, therefore, respectfully suggests that, barring further explanatory comments by the Examiner, the Examiner should chose to pursue either the rejection under 35 U.S.C. § 112 or the rejection under 35 U.S.C. § 102--but not both rejections.

In order to expedite prosecution of the present Application, however, the Applicant will address the rejections under both 35 U.S.C. § 112 and 35 U.S.C. § 102 over the question of

the magnetic transducer in the following discussions and arguments, with the explicit understanding that the Applicant does not, at present, concur with or agree with the contradictory nature of these rejections.

Therefore first considering the Examiner's objections to the drawings and the rejections of claims 15 and 20 under 35 U.S.C. § 112, first paragraph, paragraphs [011], [013], [020] and [021] of the specification as originally filed each refer to and identify and incorporate by reference the contents of WPO publication WO 01/96826 A2 with the further statement that WO 01/96826 A2 describes a magnetic transducer suitable for use in the invention as claimed. WO 01/96826 A2 has a publication date of 20 December 2001, which was before the priority and filing dates of the present Application so that WO 01/96826 A2, and the contents thereof, are incorporated by reference into the disclosure of the present Application.

WO 01/96826 A2, which is based upon International Patent Application No. PCT/EPO1/06482 filed 7 June 2001 for "MAGNETIC TRANSDUCER TORQUE MEASUREMENT", clearly and completely shows and describes, for example, in FIGS. 1 and 22 and the associated description, a magnetic torque measurement device that can be fitted directly on or in a shaft, such as a shaft of a turbine rotor.

It is therefore the Applicant's belief and position that the incorporation by reference of the teaching and description of a magnetic transducer, according to WO 01/96826 A2, into the specification of the present Application, as stated in paragraphs [011], [013], [020] and [021], thereby provides a complete and detailed description of such a transducer under the requirements and provisions of 35 U.S.C. § 112, first and second paragraphs.

It is further the Applicant's belief and position that the incorporation by reference of some of the associated teachings and descriptions of the magnetic transducer according to WO 01/96826 A2 into the specification of the present Application, based on paragraphs [011], [013], [020] and [021], satisfies the requirements of 37 CFR 1.83(a). Notwithstanding this, in order to advance prosecution of the present Application and in order to formalize the material incorporated by reference, the drawings of this application are amended to include FIGS. 1 and 22 of WO 01/96826 A2 (now FIGS. 1B and 1C, respectively), but these new Figures are appropriately marked as prior art. New Replacement Sheets of formal drawing(s), accompany

this Submission and incorporate all of the described drawing amendments. If any further amendment to the drawings is believed necessary, the Examiner is invited to contact the undersigned representative of the Applicant to discuss the same.

Suitable amended to the specification--specifically paragraph [020] thereof--describing the operation of the magnetic transducer taught by WO 01/96826 A2 is also entered in this Application. It will be noted that the addition to paragraph [020] essentially comprises the text of the Abstract and of the first paragraph of the Summary of the Invention of WO 01/96826 A2, which together contains a brief, but complete, description of how the magnetic transducer operates and how the magnetic transducer is fitted into or onto the turbine rotor. It must also be noted that the reference numerals of the new Figure are taken from FIGS. 1 and 22 of WO 01/96826 A2 are not in sequence with those already assigned in the present Application, and the Applicant indicated in the amendment to paragraph [020] that the reference numerals appearing in that portion of paragraph [020] and in the added figures are pertinent only with respect to one another and as the Figures and added text essentially comprise a quotation from WO 01/96826 A2.

It will be apparent that the pertinent portion of the content of WO 01/96826 A2 is also added and none of the entered subject matter comprises new matter as the added content was publically available since the publication date of WO 01/96826 A2 and such disclosure was incorporated into the present Application by reference at the time of filing of the above identified Application. It is respectfully submitted that these amendments are thereby fully supported by the specification, the drawings and the, claims as originally filed, and thus do not add any new matter to this application. The Applicant accordingly respectfully requests that the Examiner reconsider and withdraw the objection to the drawings under 37 CFR 1.83(a) and the rejection of claims 15 and 20, under 35 U.S.C. § 112, first paragraph.

Next, claim 21 is rejected, under 35 U.S.C. § 112, second paragraph, as indefinite for the reasons stated in the Official Action. Claim 21 is accordingly amended, by the above claim amendments, and all of the presently pending claims are now believed to particularly point out and distinctly claim the subject matter regarded as the invention, thereby overcoming all of the raised § 112, second paragraph, rejections. It will be noted that the entered claim amendments

are directed solely at overcoming the raised indefiniteness rejection(s) and are not directed at distinguishing the present invention from the art of record in this case. The Applicant therefore respectfully requests that the Examiner reconsider and withdraw the rejection of claim 21, under 35 U.S.C. § 112, second paragraph.

Next considering the rejections of the claims over the cited prior art, claims 17-21 are rejected, under 35 U.S.C. § 102(b), over Niikura et al. `737 while claims 12-16 and 22, under 35 U.S.C. § 103(a), over Niikura et al. `737 in view of Olson et al. (H964). The Applicant acknowledges and respectfully traverses the raised rejections in view of the following remarks.

First considering the claims as amended herein above, it will first be noted that a number of claims, including independent claims 12 and 17, are canceled in favor of new independent claim 23 in order to reduce and clarify the issues under consideration and to more clearly and explicitly recite the presently claimed invention, as will be discussed further in the following. It will also be noted that, in addition to the above discussed amendments to the drawings and specification in order to accommodate the material previously incorporated by reference from WO 01/96826 A2, the drawings and the specification are amended to accommodate elements that are now or had been previously recited in the claims but that had not been previously explicitly shown in the drawings and identified by reference number in the specification. In particular, the drawings and the specification are amended to explicitly show the drive motor and the electronic control unit as described, for example, in paragraph [020] and [021] of the specification as originally filed. FIG. 1 and the specification are also amended to explicitly show basic elements of the magnetic torque measurement device 7, as described in the specification as originally filed, by incorporation by reference the teachings and disclosures of WO 01/96826 A2. It must be noted, however, that these amendments are fully supported by the specification, the drawings and the claims as originally filed, do not add any new matter or alter the subject matter or scope of the invention, the disclosure or the claims.

Now first considering the present invention as recited, for example, in new claim 23, the present invention is directed to a hydrodynamic torque converter having a pump impeller 2 connected to a drive motor through a continuously variable slippable clutch 8 and hydrodynamically driving a turbine rotor 3 connected with a drive output shaft 4, and a torque

measurement device 7 for directly measuring an actual torque imposed on the drive output shaft 4 by the turbine rotor 3. According to the present invention, the torque on the drive output shaft 4 is measured solely at the output shaft 4 and is thereby measured independently of operating conditions of the drive motor 1M and turbine rotor 3.

According to the present invention as recited in the claims and as described in WO 01/96826 A2, the torque measurement device 7 includes first and second magnetic transducers spaced axially apart at first and second regions along the drive output shaft 4 and generating a torque signal representing a torque induced angular shift of magnetic profiles of the first and second regions of the drive output shaft 4. That is, the angular shift between the magnetic profiles of the first and second regions of the drive output shaft is cause by a torsional twist in the drive output shaft that is directly proportional to the torque imposed on the drive output shaft. The angular shift in the two magnetic profiles, coupled with the known diameter and torsional mechanical resistance to twisting of the drive output shaft, then allows the direct measurement and calculation of the torque that must be imposed on the drive output shaft to produce the measured torsional twisting of the drive output shaft as represented by the corresponding angular shift in the two magnetic profiles. The torque measurement device 7 thereby directly measures the actual torque transmitted through drive output shaft 4 independently of operating conditions of the drive motor and torque converter including, for example, the speed of rotation of the drive output shaft, the torque input to the torque converter from the drive motor and such factors as the temperature and viscosity of the hydraulic fluid in the torque converter.

Further according to the present invention as recited in the claims as amended, the torque signal is then provided to an electronic control unit, now shown as element 11 in amended FIG. 1 which, in turn, controls a continuously variable slippage of the clutch 8 to control the torque transferred through the torque converter to the drive output shaft 4 to a specified value.

Next considering the teachings of Niikura et al. `737 and Olson et al. (H964), the Applicant first notes that the Examiner states that Niikura et al. `737 does not describe clutch interposed in the torque input path of the torque convertor, but that Olson et al. (H964)

allegedly describes such a clutch and that it would have been obvious to either add such a clutch to Niikura et al. `737 or to add the Niikura et al. `737 to the Olson et al. (H964) torque converter. The Applicant is somewhat confused by these statements because Niikura et al. `737 describes the presence of a clutch 24, 25 and 26 connected between the torque convertor input shell 4 and the turbine runner 7 and thereby effectively in the torque input path to the torque convertor in a manner analogous to Olson et al. (H964), and the clutch as being controlled by the Niikura et al. `737 "torque sensor" so as to control the torque transferred through the torque converter. As such, the Applicant will in the following discussions consider Niikura et al. `737 to be the effective equivalent of Olson et al. (H964) as regards the input torque clutch.

Therefore considering the teachings of Niikura et al. `737, and of Niikura et al. `737 in combination with Olson et al. (H964), Niikura et al.`737 describes a magnetic torque sensor comprising permanent magnets 36, 37 mounted respectively on the turbine hub 10 and the converter output hub 8 and a stationary reed switch 38 mounted on a non-rotating sleeve. The permanent magnets actuate the reed with rotation of the turbine hub and output hub, so that the direction of rotation and speeds of rotation of the turbine hub and output hub can be sensed from the sequence and the frequency by which the permanent magnets actuate the reed switch. The turbine hub and the output hub are resiliently coupled through the turbine and will thereby tend to rotate at different speeds depending in part on the amount of torque being transferred between the turbine hub and the output hub. The turbine hub and output hub are resiliently coupled to each other through a plurality of springs 28 which resiliently resist the rotational separation of the turbine hub and output hub caused by the transfer of torque from the turbine hub to the output hub. There will be an angular difference in the rotations of the turbine hub and the output hub that will increase until the force exerted by the springs equals and offsets the rotational torsion resulting from the torque difference between the input torque applied to the turbine hub and the output torque appearing on the output hub. The torque difference between the turbine hub and the output hub can then be determined by measuring the angular displacement of the two permanent magnets as they rotate, which will be represented by the difference in the times at which the two magnets actuate the reed switch.

The "torque measurement" signal generated by the Niikura et al. `737 sensor is thereby a pulsed signal wherein the difference between the input and the output torque of the converter, as measured by the differences between the rotations of the turbine hub and the output hub, is represented by the frequency and the duration of the pulses from the reed switch. This pulse signal is applied to control the clutch of the Niikura et al. `737 converter, which is a normal lock-up clutch designed to be either engaged or disengaged rather than providing a variable coupling. According to Niikura et al. `737, therefore, the torque provided from the input shaft and through the clutch to the turbine hub is provided as a series of torque pulses and the amount of torque provided to the output hub is the time average of the input torque pulses.

It is, therefore, apparent that there are a number of fundamental distinctions between the presently claimed invention, as recited in new independent claim 23, and the teachings of Niikura et al. `737. For example, in the Niikura et al. `737 converter the "torque" is measured as a function of a difference in speed or angle of rotation between two rotating elements, the turbine hub and the output hub, that are not directly coupled to one another but that are instead only resiliently coupled by the hydraulics of the turbine and a set of springs. As such, a measurement of a difference in speed or angle of rotation or even torque between the turbine and output hubs, will not and cannot represent the torque present on the output hub. Instead, measurements taken between the turbine and output hubs as required by the Niikura et al. `737 device can represent only a difference between, for example, the rotational speeds or the torques of the turbine and output hubs. In the Niikura et al. `737 converter, therefore, it is necessary to know the torque provided to the turbine hub before the torque on the output hub can be calculated according to the measured difference between the turbine hub torque and the output hub torque. Further in this regard, however, and further illustrating the basic problem with torque, angle or speed measurements made between elements that are not fixedly coupled to one another, as in the Niikura et al. `737 convertor, the torque provided to the turbine hub is coupled to the turbine hub through a resilient, non-fixed coupling, that is, the clutch, and is dependent on the duty cycle of the clutch. It is therefore necessary to also measure the actual torque provided from the engine and to the input side of the clutch, to calculate or measure the torque, speed or angle of rotation difference between the input shaft

and the turbine hub, and, from these factors, to calculate the actual torque provided to the turbine hub.

It is, therefore, apparent that in fundamental contrast from the present invention the Niikura et al. `737 "torque measurement" device cannot, in fact, measure the actual torque appearing on the output hub but instead can measure only the proportion of the turbine hub torque that is transferred through th turbine mechanism to the output hub

It is also apparent that, again in fundamental contrast to the present invention wherein the torque on the output shaft is measured directly at the output shaft, a calculation of the actual torque delivered to the output hub in the Niikura et al. `737 converter requires an additional measurement of the torque input to the clutch and the measurement or calculation of the percentage of torque delivered through the clutch.

It must also be noted, in this regard, that the torque difference measurements obtained from the Niikura et al. `737 torque measurement device not only represents only a torque difference between to quasi-independent elements, but is also effected by a wide range of other operating parameters and factors of the converter, such as the torque transfer efficiency of the clutch when in the engaged and disengaged states, the temperature viscosity of the hydraulic fluid in the turbine components, and so on. In the Niikura et al. `737 torque measurement device, therefore, even the torque difference measurements are subject to a wide variety of variations and errors.

In the hydraulic converter of the present invention, however, and in fundamental contrast to the teachings of Niikura et al. `737, the torque on the output shaft is measured directly and solely at and on the output shaft as represented by a angular torsional twist of the output shaft caused by the torque present on the output shaft. Therefore, and in complete and basic contrast from the Niikura et al. `737 converter, the converter system of the present invention determines the actual torque on the output shaft and the torque measurements are not dependent on or a function of the operating conditions or parameters of any other element in the converter.

In still further distinctions between the presently claimed invention, as recited in new claim 23, and the teachings of Niikura et al. `737, it must be noted that in the present invention the torque is measured as a continuously variable value and the clutch is a continuously

variable slip clutch so that the torque passed through the clutch to the turbine and thereafter to the output shaft is continuously variable. In the Niikura et al. `737 converter, and in complete contrast from the present invention, the torque is controlled as a sequence of torque pulses of variable frequency of time duration, which not only would result is a seriously degraded converter life span, but provides significantly poorer control of the torque delivered to the output hub.

It is, therefore, the Applicant's belief and position that independent claim 23 is fully and patentably distinguished over and from the teachings of Niikura et al. `737, under the requirements and provisions of 35 U.S.C. § 102 and/or 35 U.S.C. § 103. It is further the Applicant's belief and position that because dependent claims 20, 21 and 24, dependent from and incorporate all recitations and limitations of claim 23, those claims are likewise fully patentably distinguished over and from the teachings of Niikura et al. `737 under the requirements and provisions of 35 U.S.C. § 102 and/or 35 U.S.C. § 103.

Next considering Olson et al. (H964), the Examiner cites as describing a clutch interposed in the torque input path of the torque convertor, and thus that it would be obvious to combine Olson et al. (H964) with Niikura et al. `737 to provide an input clutch in Niikura et al. '737. As discussed above, however, Niikura et al. `737 describes the presence of a clutch (24, 25 and 26) connected between the torque convertor input shell 4 and the turbine runner 7 and thereby effectively in the torque input path to the torque convertor in a manner analogous to Olson et al. (H964), with the clutch as being controlled by the Niikura et al. `737 "torque sensor" so as to control the torque transferred through the torque converter.

It is apparent, therefore, that the teachings of Olson et al. (H964) therefore effectively add nothing to the teachings of Niikura et al. `737 and that the combination of Olson et al. (H964) with Niikura et al. `737 teaches no more than does Niikura et al. `737 alone. In view of this, it is therefore that Applicant's belief and position that independent claim 23 is fully and patentably distinguished over and from the teachings of Olson et al. (H964) and the combination of Niikura et al. `737 in view of Olson et al. (H964) under the requirements and provisions of 35 U.S.C. § 102 and/or 35 U.S.C. § 103 for the reasons discussed above with regard to Niikura et al. `737. It is further the Applicant's belief and position that because dependent claims 20, 21 and 24 depend from and incorporate all recitations and limitations of

claim 23, those claims are likewise fully patentably distinguished over and from the teachings of Olson et al. (H964) and the combination of Niikura et al. `737 under the requirements and provisions of 35 U.S.C. § 102 and/or 35 U.S.C. § 103.

In summation, the Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw any actual or potential rejections of claim 23 and claims 20, 21 and 24 over the cited prior art under either 35 U.S.C. § 102 and/or 35 U.S.C. § 103, and allow the claims as presented herein above.

If any further amendment to this application is believed necessary to advance prosecution and place this case in allowable form, the Examiner is courteously solicited to contact the undersigned representative of the Applicant to discuss the same.

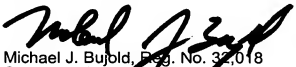
In view of the above amendments and remarks, it is respectfully submitted that all of the raised rejection(s) should be withdrawn at this time. If the Examiner disagrees with the Applicant's view concerning the withdrawal of the outstanding rejection(s) or applicability of the Niikura et al. `737 and/or Olson et al. (H964) references, the Applicant respectfully requests the Examiner to indicate the specific passage or passages, or the drawing or drawings, which contain the necessary teaching, suggestion and/or disclosure required by case law. As such teaching, suggestion and/or disclosure is not present in the applied references, the raised rejection should be withdrawn at this time. Alternatively, if the Examiner is relying on his/her expertise in this field, the Applicant respectfully requests the Examiner to enter an affidavit substantiating the Examiner's position so that suitable contradictory evidence can be entered in this case by the Applicant.

In view of the foregoing, it is respectfully submitted that the raised rejection(s) should be withdrawn and this application is now placed in a condition for allowance. Action to that end, in the form of an early Notice of Allowance, is courteously solicited by the Applicant at this time.

The Applicant respectfully requests that any outstanding objection(s) or requirement(s), as to the form of this application, be held in abeyance until allowable subject matter is indicated for this case.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,



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Annotated Drawing

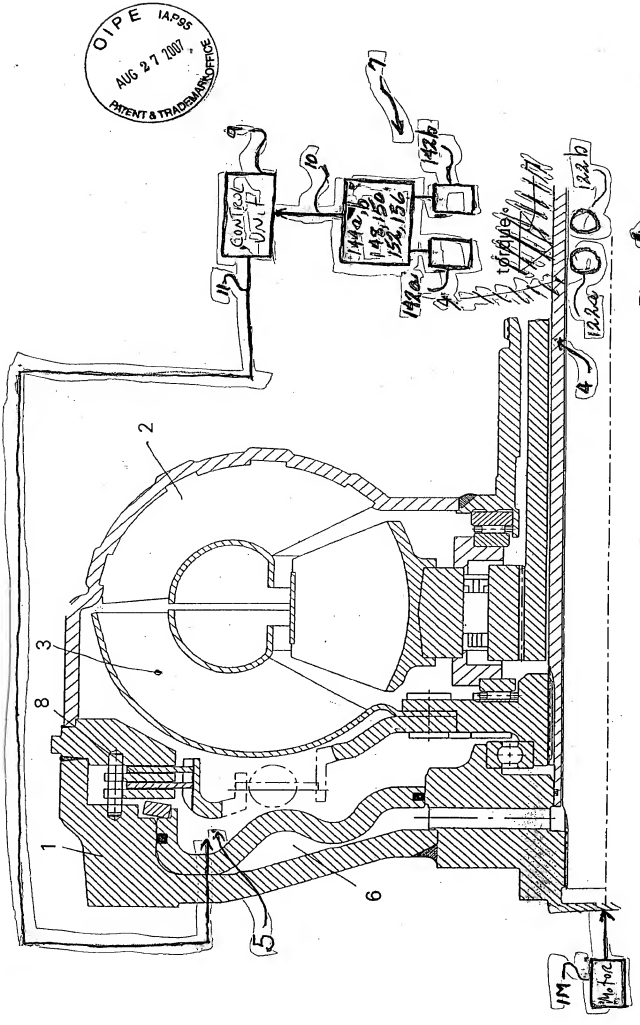

Fig. 1

Annotated Drawing

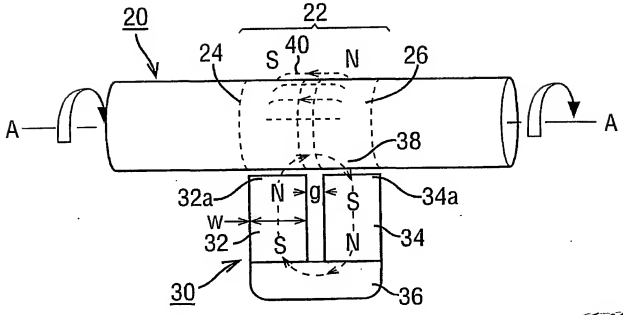

FIG. 1B
PRIOR ART

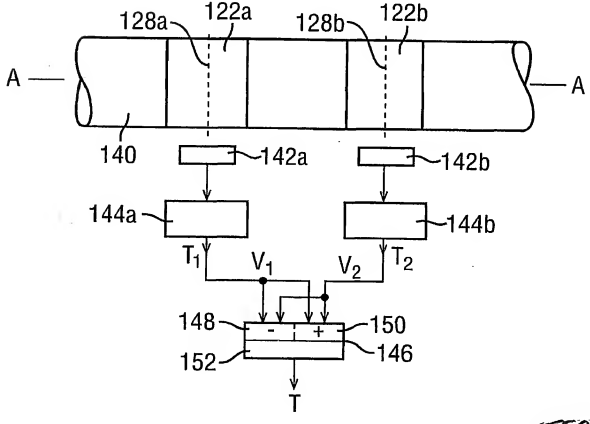

FIG. 1C
PRIOR ART

Annotated Drawing

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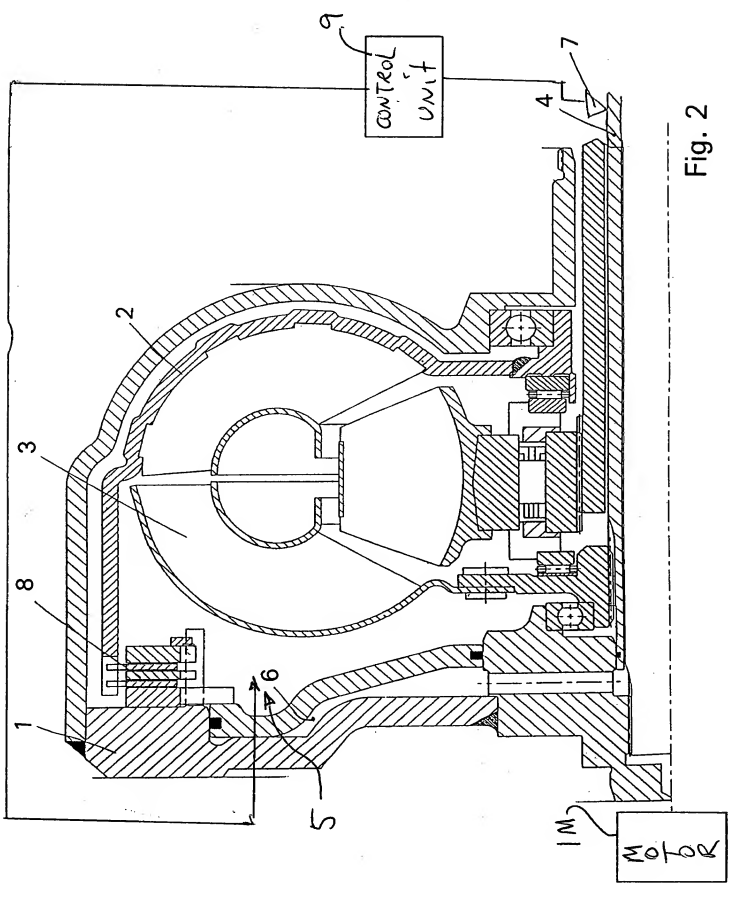

Fig. 2